

REMARKS

In order to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention, Claim 17 has been amended to state that the drawn heat-exchanger tube material is coiled horizontally in a round open-top container and that the drawn heat-exchange tube material is uncoiled from the container. Support for this amendment can be found on page 6, lines 14-17, of the present specification. No new matter has been added.

Acknowledgement is made of the Examiner's indication that the substitute specification filed on August 24, 2009 was not entered because it did not conform to 37 CFR 1.125(b) and (c) because the specification lacks section headings. 37 CFR 1.125 has no requirement that section headings be provided in a substitute specification. Moreover, there is no requirement that headings be provided in the originally filed specification. If the Examiner still refuses to enter the substitute specification and abstract, he is respectfully requested to point out where in 37 CFR 1.125 is it required that the substitute specification contain headings. Favorable consideration is respectfully solicited.

Claims 1-5 have been rejected under 35 USC 103(a) as being unpatentable over Uhlmann et al in view of Franks. Applicants respectfully traverse this ground of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a method of manufacturing lamellar U-shaped heat-exchanger tubes which comprises the steps of producing a drawn heat-exchanger tube made of a nonferrous material, coiling the drawn heat-exchanger tube material horizontally in a round open-top container, uncoiling the drawn heat-exchanger tube from the container, straightening the drawn heat-exchanger tube material, cutting the drawn heat-exchanger tube material to form two portions of a desired length either before or after annealing and subsequently cooling the drawn heat-exchanger

tube material and bending the tube portions into a U-shape to form the lamellar U-shaped heat-exchanger tubes.

As explained in the previous Response, in the conventional manufacture of lamellar U-shaped heat-exchanger tubes, thin-wall tubes are obtained in coil form from a tube manufacturer and are uncoiled by the heat-exchanger manufacturer, cut to the desired length and bent to form U-shaped tubes. When the tubes are uncoiled by the heat-exchanger manufacturer, they are ultimately subjected to an acceleration and breaking process which tends to make the thin-wall tubes susceptible to buckling. Since the delivered tubes are typically tightly wound into a coil in order to reduce the transport volume needed, problems are created during the handling of the tubes once they are removed from their transport containers, and that bend-straightening procedures, carried out under longitudinal tensile stresses, to return the tube to a straight condition result in a reduction in the average outside diameter of the tube and a reduction in the wall thickness thereof in the outer expansion region, an increase in wall thickness in the inner compression region and a flattening and ovalization of its cross-sectional area. Additionally, softening and recrystallization, which occur during the bright-annealing of the highly hardened heat-exchanger tubes, which are in the form of tightly wound coils, lead to an adaptation of the tube cross-sections to the geometrically constrained conditions of the coil and, therefore, to changes in the shape of the tube cross-section and in the layer diameters of individual turns. The present invention overcomes these problems.

The present invention provides advantages in that the usual winding of the hardened heat-exchanger tubes to form multi-layered narrow-radius coils that are limited in weight and the stack-wise annealing of those coils in a bright-annealing furnace are circumvented to avoid the problems of tightly wound tubes such as changes in cross-sectional shape in the form of ovalization, wall thickness changes,

homogeneous stress distribution and a large amount of waste lengths are removed. Once again, it is respectfully submitted that the prior art cited by the Examiner does not disclose the presently claimed invention.

The Uhlmann et al reference discloses a method of interconnecting lengths of copper tubing either in advance by welding or brazing or on-line by hollow plugs and feeding through an annealing furnace, a jacketing station and a cutter, in which a flushing gas such as air, oxygen-enriched air or an inert gas is sucked through the respective trailing end.

While the Uhlmann et al reference may disclose the uncoiling of a drawn tube material from a spool, it does not disclose the coiling of a drawn heat-exchanger tube material horizontally in a round open-top container, the subsequent uncoiling of the drawn heat-exchanger tube material from the container, the cutting of the drawn heat-exchanger tube material to form tube portions of a desired length either before or after annealing and subsequently cooling the drawn heat-exchanger tube material and bending the tube portions into a U-shape to form lamellar U-shaped heat-exchanger tubes. The Uhlmann et al reference requires that the tubing be jacketed in a synthetic envelope and used in under-floor heating and wall heating systems or for plumbing purposes. The tubing is heated to a temperature well above the evaporation temperature of an oil which is used in the disclosed process to vaporize the oil and then continuously remove it through an unconnected end of the tubing. The only way this reference is relevant to the present invention is that it shows the uncoiling of a copper tubing from a spool.

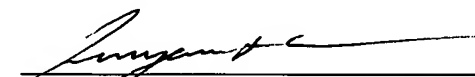
The Franks reference is directed to a method of cutting an elongated tube and an apparatus for performing the method. In this method and apparatus, a long length of tubular stock is cut into relatively small, preselected lengths and then bent into U-shaped members. The apparatus comprises a cutting device containing an annular cutting member with a radially

inner cutting edge through which an elongated, tubular element is slidably received during the advancement thereof. An actuating means effects the movement of the annular cutting member in an eccentric path around the tubular element so that the cutting operation is performed, after which the severed portion of the tube is bent and ejected from the machine.

Franks Jr. has been cited by the Examiner as disclosing the bending of the tube portions in a U-shape. However, neither Franks nor the primary Uhlmann et al reference discloses a drawn heat-exchanger tube material being subjected to an annealing and cooling step before being bent into a U-shape to avoid the problems associated with the transport of a hardened tubing. The present invention avoids the problems associated with the usual winding of a hardened heat-exchanger tube to form multi-layered narrow-radius coils that are limited in weight, changed in cross-sectional shape in the form of ovalization, wall thickness changes, homogeneous stress distribution and a large amount of waste lengths. The present invention overcomes all of these problems and, therefore, is patentably distinguishable over the prior art cited by the Examiner.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,

  
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